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Does International Outsourcing Depress Union Wages?

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First Evidence from Germany

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In this paper, we provide first empirical evidence on the effect of outsourcing on union wages using linked employer-employee data for Germany. We find that low skilled workers experience a decline in the union wage premium when working in industries with high outsourcing intensities. The finding applies to both firm- and sector-level agreements. Hence, outsourcing appears to deteriorate the bargaining position of unions. Outsourcing is not found to have a negative effect on the wages of low skilled employees not covered by collective bargaining agreements. While wages of medium skilled workers are largely unaffected by outsourcing, high skilled workers see their wages rise in industries with a high level of outsourcing. There is no interaction between coverage and outsourcing for these skill groups.

JEL Classification: F16, J51, L24

Keywords: Collective Bargaining; International Outsourcing; Union Wages

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1 Introduction

One of the most important phenomena of the recent wave of economic integration is the rush of firms to outsource an expanding range of activities abroad. In the public debate, the growing importance of international outsourcing has sparked concerns about detrimental effects on workers in industrialized countries. Trade unions in western countries fear that outsourcing will lead to job losses but also to a downward pressure on wages. In particular, the question arises whether the possibility to outsource improves the bargaining position of firms and, hence, deteriorates the outcome of the wage bargaining for unionized workers.

An interesting illustration of this possibility could be observed during the recent collective bargaining round for the German metal and electrical industry. The president of the employer association *Gesamtmetall*, Martin Kannegiesser, indirectly threatened unions with moving value added abroad, should unions not agree upon relatively moderate wage increases (Der Tagesspiegel, 2006). He also stressed the difference between the metal and electrical sector, in which value added can be and actually is moved abroad, and the public sector, in which this possibility does not exist. This statement suggests that firms operating in industries with a high outsourcing intensity may have indeed a better bargaining position vis-a-vis the respective union.

In the academic realm, a number of theoretical contributions have shed light on the labor market effects of international outsourcing (see, for instance, Feenstra and Hanson 1996, 1999). However, the issue of trade unionism is barely mentioned in these studies. Only recently Lommerud, Meland, and Straume 2005 have analyzed a model of wage bargaining between a union and a firm with the latter having the choice to either produce intermediate inputs in-house or import them from a foreign supplier. Somewhat surprisingly, Lommerud, Meland, and Straume (2005) find, among other things, outsourcing to actually *increase* union wages. From the perspective of the union outsourcing 'exogenizes' a larger share of wage costs. Hence, the wage elasticity of labor demand declines and unions will enforce higher wages for the remaining in-house production.

In a related framework, Braun and Scheffel (2007) show that the stark result of Lommerud, Meland, and Straume (2005) depends on the assumption that firms decide on the level of outsourcing before the wage bargaining takes place. When the degree of outsourcing can adapt to domestic wages, unions also take their influence on the outsourcing decision into account. Braun and Scheffel (2007) find that the ease with which a firm can outsource parts of the production has an ambiguous effect on the bargained wage. Hence, their research suggests that empirical work is needed to establish the net effect of outsourcing on union wages.

To the best of our knowledge the issue at hand has not yet been analyzed empirically. There exists a number of empirical studies investigating the effect of outsourcing on wages (see,

for instance, Geishecker 2002, Geishecker and Görg 2004, 2005 for Germany, and Hijzen, Görg, and Hine 2005 for the UK). However, trade unionism is absent in the literature. The present study therefore aims to fill the gap by providing an empirical assessment of the effect of international outsourcing on union wages.

For doing so we combine data from the German Linked Employer-Employee (LIAB) data set, which is described in some detail below, and industry level data on international outsourcing. Germany is an interesting case to study because of the strong influence of unions on the wage setting process. Our analysis suggests that international outsourcing indeed reduces the union wage premium but the finding applies only to low skilled workers. We do not find an effect of outsourcing on wages of non-covered low-skilled workers. The negative effect of outsourcing on the wages of low-skilled workers, a result established by Geishecker and Görg (2005), seems to operate via the impact on the union wage premium. For high skilled workers we find a positive wage effect of outsourcing but the effect does not vary with the bargaining regime.

The remainder of the paper is structured as follows. Section 2 provides an overview on collective bargaining in Germany. Section 3 then describes the econometric strategy of the paper. The data set and variables used in the analysis are presented in section 4. Results are then provided in section 5. Finally, section 6 concludes.

2 Collective Bargaining in Germany

Since the beginning of the 1980s union membership rates in Germany are in a steady decline. Adjusted union density, i.e. union members in percent of all employed wage and salary earners, has fallen from 34.9 in 1980 to 22.6 per cent in 2003 (Vlisser 2006). However, in Germany (like in many other European countries) there exists a strong divergence between union density and bargaining coverage with many more employees covered than being member of a union.

Bargaining autonomy (*Tarifautonomie*) is a constitutionally protected principle that gives employer and employee associations the right to regulate employment conditions through collective agreements on their own responsibility and without any state interference. Within the system of collective wage bargaining, collective agreements are most often concluded as multi-employer agreements at the industry level (*Branchentarifverträge*). These contracts are typically negotiated between an industry-specific trade union and the corresponding employers' association. While the agreement is legally binding only for union members working in a firm, which itself is a member of the employers' association, the regulations are typically extended to non-members as well. Moreover, the Federal Ministry of Labor can declare an agreement to be binding for non-member firms and their employees as well.

In 2004, 41 (19) per cent of all firms in West (East) Germany were subjected to a sectoral bargaining agreement.[1] Since larger firms are more likely to be covered,[2] wages of 61 (41) per cent of all employees in West (East) Germany are determined by industry-wide collective agreements. Although these numbers eroded somewhat in recent years, the majority of workers in Germany is still covered by industry-wide collective agreements.

In addition to multi-employer agreements at the industry level, there also exist single-employer agreements (*Firmentarifverträge*) at the company level. Only 2 (4) per cent of West (East) German firms have concluded a firm-specific contract with their respective industry union in 2004. The proportion of employees covered by company-specific collective agreements is considerably larger and amounted to 7 and 12 per cent in West- and East-Germany, respectively.

In summary, collective bargaining is still of great importance to the wage-setting process in Germany despite of declining union membership rates. Due to the great divergence between membership and coverage rates, information on the latter is crucial to assess the wage effect of unions in Germany. Since different bargaining regimes coexist, not only the wage effect of being covered but also the relative effect of firm-level versus sector-level agreements can be established.

3 Empirical Model

We estimate the following Mincer-type wage equation for worker i being employed in establishment j in industry k at time t:[3]

$$\begin{aligned} \ln w_{ijkt} &= \mathbf{X}_{it}\mu_X + \mathbf{Z}_{jt}\mu_Z + S_{jt}\beta_S + F_{jt}\beta_F + OUT_{kt}\gamma + S_{jt}OUT_{kt}\delta_C \\ &\quad + F_{jt}OUT_{kt}\delta_F + \sigma_k + \Phi_t + \omega_{kt} + \upsilon_{ijkt}, \end{aligned} \tag{1}$$

where the error component can be written as

$$\upsilon_{ijkt} = \alpha_i + \theta_j + \epsilon_{ijkt}. \tag{2}$$

The dependent variable, $\ln w_{ijkt}$, is the gross daily wage of individual i. $\mathbf{X}_{it}$ is a vector of observed individual characteristics while $\mathbf{Z}_{jt}$ denotes firm characteristics. S_{jt} and F_{jt} are dummy variables indicating whether a firm is subjected to a sector-level or a firm-level contract, respectively. OUT_{kt} measures the degree of outsourcing in industry k. In order to analyze the effect of outsourcing on the wage premium we interact the outsourcing variable

[1] Data come from Ellguth and Kohaut (2005) who base their analysis on the *IAB Establishment Panel*.

[2] For instance, only 8 (15) per cent of the firms with 500 and more employees are not covered by any kind of collective bargaining agreement.

[3] The model is closely related to the one presented by Geishecker and Görg (2004). See also Mincer (1974).

with the indicator variables for contract status. Industry and time dummies (σ_k and Φ_t) are included to control for unobserved industry-specific effects as well as unobserved time effects that are common across all individuals. Industry specific time trends are accounted for by including ω_{kt}. The unobserved component consists of an unobserved individual-specific effect α_i, establishment-specific unobserved heterogeneity θ_j and a stochastic error term ϵ_{ijkt}.

In this paper, we consider outsourcing to be a make-or-buy decision and define it accordingly as the shift of an industry's core activities abroad. The volume of this process at the industry level can be approximated by the value of imported intermediate inputs as a share of the total production within this industry (see Feenstra and Hanson 1996 and Feenstra and Hanson 1999). The indicator is consequently defined as

$$OUT_{jt}^{narrow} = \frac{IMP_{jt}}{Y_{jt}}, \tag{3}$$

where j denotes the respective two digit manufacturing industry, IMP_{jt} indicates the value of intermediate inputs imported from a foreign industry and Y_{it} describes the industry's total output value. Note that the definition only takes into account imports from the same industry abroad.[4]

In a first step, we pool the data and estimate the model by a conventional OLS regression.[5] Assuming that α_i and θ_j are uncorrelated with contract status (and outsourcing), we obtain consistent estimates of $\mu_X, \mu_Z, \beta_S, \beta_F, \gamma, \delta_C, \delta_F$.

More generally, the unobserved worker- and firm-specific effects may be correlated with contract status. For instance, Lewis (1986) claims that unionized firms can choose from a larger pool of (queuing) workers. This then gives rise to a positive correlation between (unobserved) individual ability and contract status. Likewise, contract status may be correlated with firm-level characteristics that are associated with higher wages (DiNardo and Lee 2004). Arguably, the problem of unobserved effects, and in particular of unobserved firm effects, should be relatively small in our case as we are able to control for a large set of individual *and* firm characteristics.

Nevertheless, by estimating a spell fixed-effects model we can easily eliminate α_i and θ_j. However, the identification of the effect of contract status will then hinge solely on within-establishment variation in contract status. Table 4 shows that only relatively few firms change their contract status over time. These firms might not be representative for the sample as a whole and might be in special economic situations. More importantly, a

[4] Alternatively, a wider definition of outsourcing would include intermediates imported from all manufacturing industries. Hijzen, Görg, and Hine (2005) argue that the narrow definition is more appropriate for the analysis of wages as it concentrates on changes in factor demands within industries.

[5] Standard errors are adjusted by clustering on the firm-level thereby allowing for a shared error component. See Moulton (1990) for further details.

change in contract status should not have any immediate effect on individual wages. A worker's existing contract will not be affected if her employer chooses to leave the employer association. In fact, *future* wage rises may be more moderate in the newly uncovered firm but our dataset is too short with very few observations per worker (average of 2.5), so it is highly questionable whether these changes are observed in the data. Since we are able to control for all important firms characteristics identified in the literature,[6] a possible remedy to this problem is to control for individual specific fixed effects only. Then workers who change between firms with different contract status would also contribute to the identification of the wage premium. Unfortunately, workers are not followed in the LIAB. If a worker leaves one firm documented in the dataset and joins another that also appears in the data, it is by pure coincidence. Table 4 documents that only a tiny fraction (at about 0.2 per cent) of all individuals are observed to move from a covered to a non-covered firm or vice versa. Therefore, controlling directly for fixed effects without losing the essence of the information in the data appears to be not feasible in practice.

In order to control at least partially for unobserved individual specific effects we follow Card and De la Rica (2006) who argue that "Under plausible assumptions about the hiring process, workers with higher unobserved ability will tend to have coworkers with higher average skills" (p. 581). Since the dataset we use contains not only information about the individual worker but also on those working in the same enterprise, the effects of unobserved ability can at least partially be eliminated by controlling for co-worker characteristics.

A second problem that may confound our results is the possible endogeneity of the outsourcing variable. In fact, outsourcing may not only affect wages but the latter may also have an impact on the former. Though an important consideration in pure industry level regressions, the outsourcing intensity on an industry level should be considered to be largely exogenous with respect to the wage of the individual worker (see e.g. Geishecker and Görg 2005, Munch and Skaksen 2005). Hence, the endogeneity bias due to the simultaneous determination of outsourcing intensities and wages, which may have confound the results of previous industry-level studies such as Feenstra and Hanson 1996, 1999, should be minimized when combining individual and industry level data.

4 Data and Variable Description

For our analysis, we confine attention to full-time employees aged 18 - 65 working in manufacturing industries.[7] The time period considered is 1996 to 2000 for Germany as a whole and 1995 to 2000 for the western part only. The restriction to the mentioned time span

[6] In particular, it has been found that firm size is a non- negligible control variable when estimating union wage premia (see Andrews, Stewart, Swaffield, and Upward 1998).

[7] The manufacturing industries correspond to the two-digit NACE categories 15-36.

is dictated by data availability. While prior to 1995 no information on collective bargaining coverage was collected, the Input-Output tables used for constructing our measure of outsourcing are only comparable up to the year 2000. The main focus of the study lies on Germany as a whole because outsourcing measures are not available for East- and West-Germany separately. Since the collective bargaining situation differs significantly between the two parts, we also run regressions for West Germany only in order to check the robustness of our results. Our study is based on data from the Linked Employer-Employee data set (LIAB) which combines data from the Employment Statistics Register of the German Federal Labor Services with plant level data from the IAB-Establishment Panel for the period of 1993-2004. Data on imported intermediates and total production are obtained from Input-Output tables available from the German Federal Statistical Office.

The Employment Statistics Register provides information on the individual worker. It is an administrative panel data set that covers one percent of all employees registered by the social insurance system.[8] Employers are obliged to notify certain individual as well as workplace characteristics. From this dataset we obtain common socio-economic characteristics such as sex, nationality or educational attainment. A detailed list of the variables used can be found in table 3. The dependent variable in our wage regression is the logarithm of gross daily wages. Unfortunately, wage rates are only reported up to the contribution limit of the social security system. In total, 13 per cent of our wage observations are top-coded. Not surprisingly, the problem is most dominant for high-skilled workers. While 55 per cent of the wage observation on high skilled workers exceed the contribution limit, top-coding is almost absent in the wage data on the low skilled (see table 5). In order to handle this problem, wages are imputed following the procedure proposed by Gartner (2005) according to which right-censored observations are replaced by values obtained from random draws from a truncated normal distribution. The moments of this distribution are constructed from predicted values of a Tobit regression with the truncation point being the yearly contribution limit to the social security system. When interpreting the estimation results for the high skilled, one has to keep in mind that more than half of the wage observations of this group are top-coded and were thus imputed.

The IAB Establishment Panel data set is a representative annual sample of German establishments that have at least one employee paying social security contributions. Prior to 1996 only West German firms were covered, while from 1996 onwards data on enterprises in both parts of Germany are provided. The firms are asked to report, amongst other things, information on their employee structure as well as their economic performance. In our regression we include information on the firm size, the capital-labor ratio as well as the share of exports in total revenues. Furthermore, as described in section 3 we compute average co-worker characteristics of employees in the same occupational category being employed

[8] A more detailed description of the dataset can be found in Bender, Haas, and Klose (2000).

in one firm in order to control for unobserved individual heterogeneity. Following Card and De la Rica (2006), co-worker characteristics are calculated with respect to age, gender and skill levels. Of special interest to our research question is the fact that the Establishment Panel contains information on whether or not a firm is bound to a collective bargaining agreement on the firm- or sector-level. Note that the coverage information is reported by the employer and applies automatically to all workers employed by the firm irrespective of the true nature of the work contract.

Tables 5 and 6 provide descriptive statistics not only for the complete sample but also separately for contract types, skill groups as well as the two parts of Germany. The data confirms the perception that collective bargaining plays a dominant role in the manufacturing sector (see Hassel 1999 and Addison, Schnabel, and Wagner 2007). The lion's share of all employees is covered by an industry agreement (88%). In addition, the wages of 7% of individuals in our sample are governed by collective agreements concluded at the firm level. The remaining 5% are not covered by any type of collective agreement.[9] Comparing the summary statistics for the different contract types reveals marked differences. Employees with an individual contract earn the lowest wages and are employed in smaller, less export-oriented enterprises with an average workforce of about 561 employees. They have fewer years of tenure but appear to be slightly better educated. Furthermore, disproportionately many females are not covered by collective bargaining agreements.

Coverage rates differ significantly between the Eastern and the Western part of Germany. While on average 96% of all individuals in West Germany are covered by some kind of collective agreement, this holds for only 79% of the East German employees in manufacturing. Not surprisingly, wages in the East are on average significantly lower than in the western part. People employed in East Germany are on average somewhat older, are almost exclusively of German nationality, work in smaller enterprises and are less likely to be low skilled in comparison to employees in West Germany.

Table 7 reveals the distribution of contract types for the various manufacturing industries. Marked differences in the importance of the different collective bargaining regimes exist. More than 95% of all employees in the tobacco, electrical equipment as well as in production of instruments are covered by industry-wide collective agreements. These kinds of agreements are of minor importance in the leather and computer sector. The latter is also the industry in which only individual contracts are observed. Individual contracts are absent in tobacco, the paper and the coke and petroleum industry.

As evident from figure 1, the degree of outsourcing has steadily grown over the period of investigation, from about 6% in 1995 to more than 8.5% in 2000. Figure 2 illustrates that an upward trend can be observed in nearly all sectors. However, the importance of outsourcing differs greatly between manufacturing industries. The outsourcing measure as

[9]Note that the figures are not representative since large firms are oversampled in the IAB Establishment Panel.

defined by equation 3 suggests that outsourcing plays a minor role in industries such as food, textiles, publishing as well as in the production of glas, plastic and metal products. On the contrary, it is of considerable importance to, for instance, the clothing, leather, radio and TV sector.

5 Results

5.1 Germany

We start with estimating the pooled model for Germany as a whole. The model is estimated not only for the whole sample but also separately for different skill groups. An overview of the estimation results for the full model can be found in table 8. Covariates like gender, tenure or firms size enter with the expected signs and are generally highly statistically significant. Estimation results relevant to the underlying question of the paper are summarized in table 1.

Estimating the model for all individuals suggests that workers covered by a collective industry agreement receive a wage premium of 6.1 per cent relative to non covered workers. Firm agreements secure employees a premium of 5.7 per cent when compared to non covered workers. The coefficient on outsourcing is positive but statistically insignificant. The interaction terms between outsourcing and both types of coverage are negative but again not significant. Hence, we neither find evidence for a direct effect, i.e. an effect independent from the bargaining regime, of outsourcing on wages nor for any impact of outsourcing on the wage premium of workers covered by collective agreements.

The results change markedly if the regression is performed separately for the different skill groups. In line with previous empirical evidence, the union wage premium is the highest for low-skilled workers. We find a statistically significant premium of 14.7 and 12.2 per cent for workers covered by sectoral and firm agreements, respectively. Outsourcing continues to have no direct effect on wages. However, the estimation shows that the union wage premium varies widely with the outsourcing intensity. A one per cent increase in the outsourcing indicator is found to result in a 0.8 per cent decrease in the wage rate of workers covered by sectoral agreements. Consequently, the union wage premium shrinks to 8.5 per cent when evaluated at the mean of the outsourcing indicator. It is also interesting to assess the influence of outsourcing on the coverage premium within a specific industry, say the textile sector. The estimates suggest that in this sector the premium of being covered by a sectoral agreement has decreased from 8.3 to 6.9 per cent between 1995 and 2000 as a result of the increased outsourcing intensity. We also find evidence for a negative effect of outsourcing on low-skilled workers covered by firm level agreements. With a coefficient of 0.7 per cent the effect is slightly less pronounced for this kind of bargaining regime.

For medium-skilled workers the union wage premium is only evident when collective agreements are concluded at a sectoral level. The markup is much smaller than for low-skilled workers and stands at 4.3 per cent. Outsourcing has neither a statistically significant direct wage effect nor any impact on the wage premium. On contrary, for high-skilled workers the estimation shows that outsourcing actually increases wages, a result consistent with the finding in Geishecker and Görg (2004). A one per cent increase in the indicator is associated with a 0.79 per cent increase in wages. While a union wage premium of 5 per cent for high skilled workers covered by an industry agreement is established, the interaction terms between outsourcing and coverage are not statistically significant.

As discussed in section 3 the results may be biased due to unobserved heterogeneity. In order to deal with this problem,[10] we add mean co-worker characteristics to our baseline model, averaged over employees at the same firm and in the same occupation.[11] Table 1 documents that the inclusion improves the model fit considerably. For the whole sample the R^2 increases from 0.526 to 0.575. Employees working in firms in which a high fraction of co-workers are male and high-skilled are found to earn higher wages. On the contrary, low-skilled and young co-workers depress earnings.

While the overall findings of the estimations without co-worker characteristics are confirmed, coefficients and standard errors do change somewhat. The wage premia of being employed in an enterprise covered by collective agreements are estimated to be somewhat lower in the case of low-skilled workers. The figures decline to 13.2 and 11.9 per cent, respectively, for sector- and firm-level agreements. The coefficients on the interaction terms between the two types of coverage and outsourcing increase slightly. The estimates are generally more precise after the inclusion of co-worker characteristics. The wage premium for sector- and firm-level contracts are virtually unchanged for medium-skilled workers. However, the effect of firm-level agreements is now statistically significant, even though only barely at the 10 per cent level. Finally, for high-skilled workers the estimation suggests that the positive wage effect of outsourcing is somewhat less pronounced than previously estimated. The same finding applies to the impact of collective agreements at the sectoral level. The respective coefficients both drop by approximately 10 per cent to 0.008 and 0.045, respectively, while significance levels remain unchanged.

[10] As discussed in section 3, applying fixed effects estimations can not be regarded as a feasible solution to the problem due to data constraints. In fact, estimating the model with spell fixed effects renders union wage premia insignificant. However, the interaction terms between outsourcing and the two types of collective bargaining regimes are still negative and statistically significant for low-skilled workers.

[11] We also employ mean characteristics that are averaged over all workers in the same firm. While the main conclusions and results do not change, the model fit is somewhat lower.

Skill Level	All	Low	Medium	High	All	Low	Medium	High
out	0.005	0.004	0.003	0.008**	0.007**	0.008	0.005	0.008**
	(0.003)	(0.006)	(0.003)	(0.003)	(0.003)	(0.005)	(0.003)	(0.003)
sector	0.061***	0.147***	0.043**	0.050**	0.057***	0.132***	0.042**	0.045**
	(0.022)	(0.036)	(0.019)	(0.024)	(0.017)	(0.028)	(0.015)	(0.020)
sector ∗ out	-0.002	-0.008**	0.000	-0.000	-0.002	-0.009***	-0.001	-0.001
	(0.002)	(0.004)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)
firm	0.047**	0.122***	0.032	0.039	0.049**	0.119***	0.035*	0.034
	(0.026)	(0.039)	(0.024)	(0.026)	(0.022)	(0.032)	(0.021)	(0.023)
firm ∗ out	-0.002	-0.007*	-0.000	-0.001	-0.001	-0.007**	0.000	-0.001
	(0.002)	(0.004)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)
meanmale	-	-	-	-	0.132***	0.260***	0.116***	-0.041
					(0.020)	(0.025)	(0.021)	(0.034)
meanageu30	-	-	-	-	-0.597***	-0.426***	-0.533***	-0.691***
					(0.084)	(0.142)	(0.092)	(0.091)
meanageue50	-	-	-	-	0.390***	0.236*	0.391***	0.203***
					(0.091)	(0.143)	(0.098)	(0.077)
meanalter	-	-	-	-	-0.020***	-0.015**	-0.018***	-0.014***
					(0.004)	(0.006)	(0.005)	(0.004)
meanlskill	-	-	-	-	-0.212***	-0.126***	-0.256***	-0.151***
					(0.024)	(0.028)	(0.030)	(0.030)
meanhskill	-	-	-	-	0.337***	0.439***	0.403***	0.218***
					(0.020)	(0.050)	(0.027)	(0.023)
R^2	0.526	0.372	0.409	0.427	0.575	0.414	0.488	0.447
N	2830595	570214	1947490	312891	2830595	570214	1947490	312891

***, **, * statistically significant at the 1, 5 and 10 per cent level, respectively
We furthermore used a full set of industry, year and federal state dummies as well as industry-wide time trends that are not explicitly listed here. The regression also included other individual and firm characteristics as described in 3. Standard errors are calculated with clustering by firms.

Table 1: Estimation Results for Germany

5.2 West Germany

As described in section 2, the bargaining regimes in East and West Germany differ markedly. Hence, it is important to see whether our results are robust when the sample is divided between the two parts of Germany. Unfortunately, input-output tables, and, hence, the outsourcing indicator, are not available for East and West Germany separately. However, given the economic dominance of West Germany[12] the outsourcing indicator for Germany may also be regarded as a reasonable approximation to the level of outsourcing in West Germany. Keeping these limitations in mind, we re-estimate the model restricting the sample to West-German workers only. The results are depicted in table 2.

The estimation indicates a positive effect of outsourcing on West German wages even if workers are not divided by skill levels. Coverage premia are found to be positive and weakly significant, while the interaction terms between the two bargaining regimes and outsourcing are negative and also weakly significant. Estimating the model using data on all West German workers masks that the effects vary greatly with the level of schooling. For low-skilled workers no direct wage effect of outsourcing is established. In line with the evidence for Germany as a whole, covered low-skilled workers are much better paid than non-covered employees but the wage premium is negatively related to the sectoral

[12]In 2006, the West German Länder (without Berlin) accounted for at about 85 per cent of total GDP.

outsourcing intensity. The magnitude of these effects is very similar to those estimated for the complete German sample. While the coverage markups are slightly larger in the West, the interaction terms are somewhat smaller.

In contrast to the results for the overall German sample, we also find a positive direct effect of outsourcing on domestic wages for West German employees with a medium level of skills. The previous finding of a positive effect of outsourcing on wages of high-skilled workers is confirmed but the estimates suggest this effect to be more pronounced in the Western part of Germany. We do not find any evidence for positive wage effects of coverage on wages for medium- and high-skilled workers. In summary, restricting the sample to West German employees generally confirms our results for low-skilled workers. For medium- and high-skilled workers stronger evidence for a positive direct wage effect of outsourcing is presented while the estimations do not reveal a statistically significant effect of coverage for these skill groups.

Skill Level	All	Low	Medium	High	All	Low	Medium	High
out	0.009**	0.003	0.007*	0.010**	0.011***	0.007	0.009**	0.010***
	(0.004)	(0.006)	(0.004)	(0.005)	(0.004)	(0.005)	(0.004)	(0.004)
sector	0.058*	0.141***	0.030	0.030	0.057**	0.127***	0.031	0.018
	(0.030)	(0.038)	(0.026)	(0.034)	(0.023)	(0.029)	(0.020)	(0.025)
$sector * out$	-0.006*	-0.009**	-0.004	-0.002	-0.006**	-0.009***	-0.004	-0.003
	(0.003)	(0.004)	(0.003)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)
firm	0.055*	0.118***	0.037	0.018	0.060**	0.117***	0.041*	0.009
	(0.033)	(0.042)	(0.030)	(0.035)	(0.026)	(0.033)	(0.024)	(0.028)
$firm * out$	-0.005*	-0.008*	-0.004	-0.002	-0.005*	-0.007**	-0.003	-0.002
	(0.003)	(0.004)	(0.003)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)
meanmale	-	-	-	-	0.112 ***	0.253***	0.076***	-0.064
	-				(0.022)	(0.026)	(0.024)	(0.038)
meanageu30	-	-	-	-	-0.478***	-0.407***	-0.479***	-0.578***
					(0.098)	(0.150)	(0.106)	(0.098)
meanageue50	-	-	-	-	0.331 ***	0.251*	0.366***	0.106
					(0.105)	(0.146)	(0.110)	(0.084)
meanalter	-	-	-	-	-0.014***	-0.015**	-0.014***	-0.004
					(0.005)	(0.007)	(0.005)	(0.004)
meanlskill	-	-	-	-	-0.209***	-0.128***	-0.260***	-0.133***
					(0.025)	(0.029)	(0.031)	(0.032)
meanhskill	-	-	-	-	0.374***	0.452***	0.417***	0.256 ***
					(0.025)	(0.053)	(0.032)	(0.028)
R^2	0.490	0.360	0.308	0.279	0.547	0.403	0.408	0.447
N	2604552	560385	1773506	270661	2604552	560385	1773506	270661

***, **, * statistically significant at the 1, 5 and 10 per cent level, respectively
We furthermore use a full set of industry, year and federal state dummies as well as industry-wide time trends that are not explicitly listed here. The regression also included other individual and firm characteristics as described in 3. Standard errors are calculated with clustering by firms.

Table 2: Estimation Results for West Germany only

6 Conclusion

This paper has provided first empirical evidence on the effect of outsourcing on the wage premium of collective bargaining agreements. We find that low skilled workers experience a decline in the union wage premium when working in industries with high outsourcing

intensities. The finding applies to both firm- and sector-level agreements. Outsourcing is not found to have a negative effect on the wages of employees not covered by collective bargaining agreements. The result suggests that the negative impact of outsourcing on the wages of German low skilled workers, as established by Geishecker and Görg (2004), operates via the effect on the union wage premium. While wages of medium skilled workers are largely unaffected by outsourcing, high skilled workers employed in industries with a high level of outsourcing see their wages rising. However, there is no interaction between coverage and outsourcing.

In summary, we find evidence for the hypothesis that outsourcing deteriorates the bargaining position of unions and reduces the bargained wage. However, the finding applies to low skilled workers only. A possible explanation for this result could be that outsourcing puts at risk particularly the jobs of the low skilled. Hence, wage restraints are more readily accepted in this skill group.

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Appendix

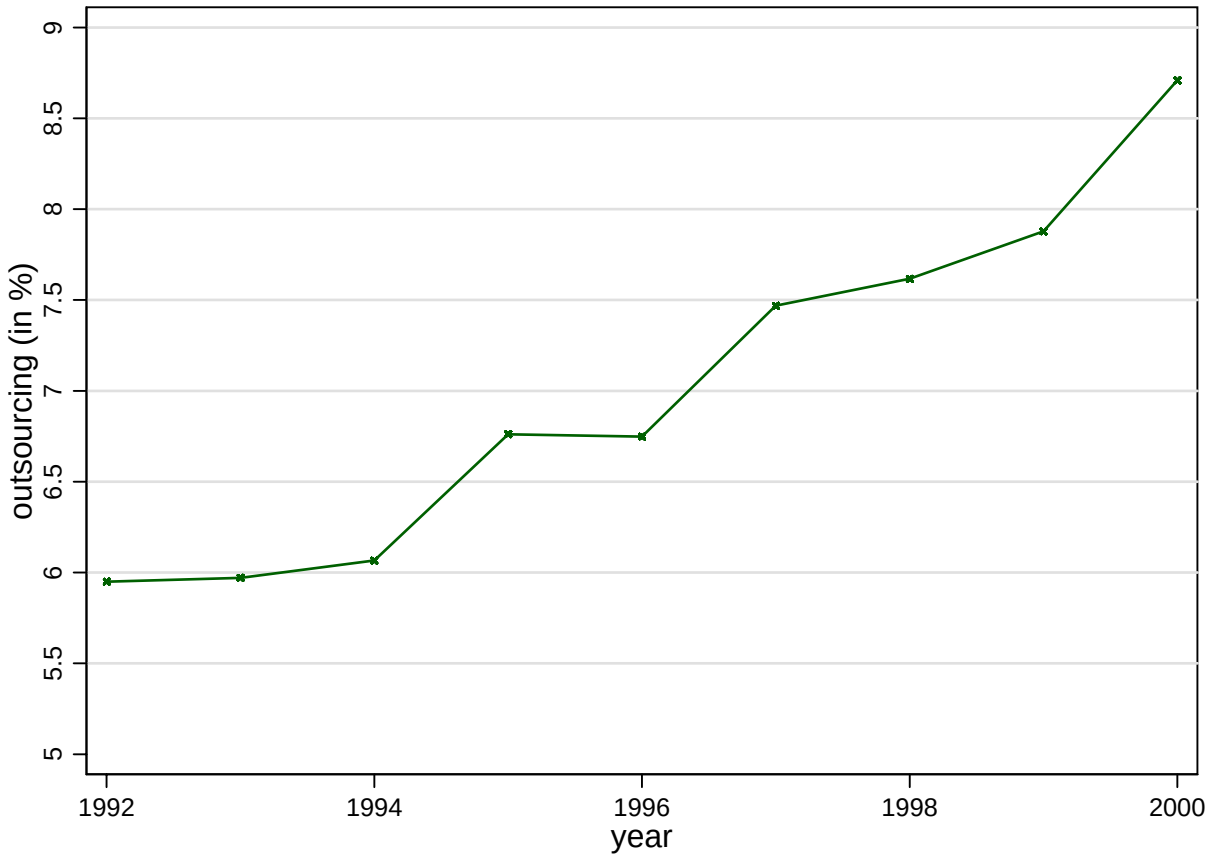

Figure 1: Outsourcing over time (weighted average of industries)

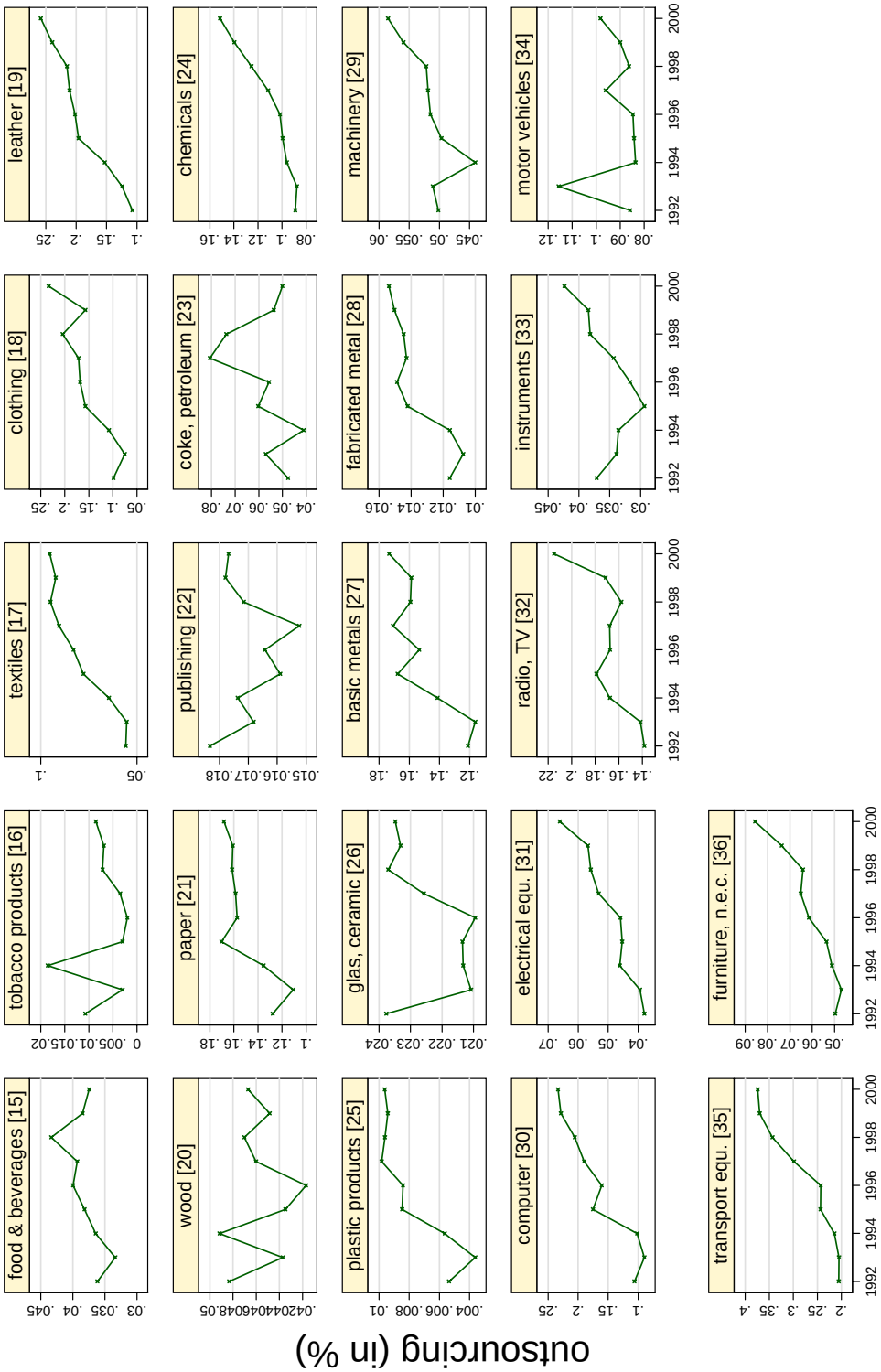

Figure 2: Outsourcing by manufacturing industry

Variable	description
demographics:	
agegr1	dummy indicating people aged 18-25
agegr2	dummy indicating people aged 26-35
agegr3	dummy indicating people aged 36-45 (reference category)
agegr4	dummy indicating people aged 46-55
agegr5	dummy indicating people aged 56-65
male	male dummy
german	indicates whether individual has the German citizenship
human capital:	
tenure	tenure in years
tenure2	square of tenure
lskill	dummy variable indicating 8 or 10 years of schooling
mskill	dummy variable indicating 11, 13, or 15 years of schooling
hskill	dummy variable indicating 17 or 18 years of schooling
job related information:	
lneuro	log of daily gross wages
white	dummy indicating white-collar job
sector	industry-wide collective agreement
firm	firm-wide collective agreement
firmsize1	1-4 employees
firmsize2	5-9 employees
firmsize3	10-19 employees
firmsize4	20-49 employees
firmsize5	50-99 employees
firmsize6	100-199 employees
firmsize7	200-499 employees
firmsize8	500-999 employees
firmsize9	1000-4999 employees
firmsize10	more than 5000 employees (reference category)
firm variables:	
export	export share
kaplab	capital per employee
meanmale	indicates the average share of male workers in the same firm and occupation
meanageu30	indicates the average share of workers below the age 30 in the same firm and occupation
meanageu50	indicates the average share of workers above the age 50 in the same firm and occupation
meanalter	indicates the average share of workers in the same firm and occupation
meanlskill	indicates the average share of low-skilled workers in the same firm and occupation
meanhskill	indicates the average share of high-skilled workers in the same firm and occupation
industry variables:	
out	narrow outsourcing indicator per industry and year
out*sector	interaction term: narrow outsourcing*industry agreement
out*firm	interaction term: narrow outsourcing*firm agreement

We furthermore used a full set of industry, year and federal state dummies as well as industry-wide time trends that are not explicitly listed here.

Table 3: Overview of the relevant variables used in the analysis.

	all	**low**	**medium**	**high**
general changes of contract type:				
sector → firm	0.015	0.016	0.015	0.011
	(0.120)	(0.125)	(0.121)	(0.102)
sector → none	0.014	0.011	0.015	0.009
	(0.117)	(0.105)	(0.122)	(0.096)
none → sector	0.016	0.013	0.017	0.010
	(0.124)	(0.112)	(0.129)	(0.100)
none → firm	0.012	0.011	0.013	0.009
	(0.109)	(0.106)	(0.111)	(0.094)
firm → sector	0.016	0.017	0.016	0.011
	(0.126)	(0.129)	(0.127)	(0.106)
firm → none	0.011	0.011	0.011	0.007
	(0.102)	(0.104)	(0.103)	(0.085)
all	0.083	0.079	0.087	0.058
changes in contract type due to change of the firm:				
sector → firm	0.001	0.001	0.001	0.001
	(0.025)	(0.025)	(0.024)	(0.029)
sector → none	0.001	0.000	0.001	0.001
	(0.025)	(0.016)	(0.026)	(0.036)
none → sector	0.000	0.000	0.001	0.001
	(0.021)	(0.011)	(0.022)	(0.023)
none → firm	0.000	0.000	0.000	0.000
	(0.010)	(0.009)	(0.009)	(0.020)
firm → sector	0.000	0.001	0.000	0.000
	(0.022)	(0.025)	(0.021)	(0.022)
firm → none	0.000	0.000	0.000	0.000
	(0.009)	(0.006)	(0.008)	(0.015)
all	0.002	0.002	0.002	0.004
N	4549887	905787	3145312	498788

Table 4: Percentage of people changing the contract type and direction of these changes, for all people and by skill groups.

Variable	**all**	**low**	**medium**	**high**
daily wage	95.09	79.43	94.56	126.88
	(27.98)	(21.87)	(26.47)	(19.96)
log daily wage	4.52	4.35	4.51	4.83
	(0.32)	(0.28)	(0.31)	(0.21)
fraction topcoded	0.13	0.02	0.09	0.55
	(0.33)	(0.14)	(0.28)	(0.50)
individual characteristics:				
mean age	40.26	41.74	39.59	41.80
	(10.17)	(10.32)	(10.20)	(9.20)
fraction male	0.83	0.71	0.85	0.90
	(0.38)	(0.45)	(0.36)	(0.31)
fraction german	0.89	0.69	0.94	0.96
	(0.31)	(0.46)	(0.24)	(0.19)
mean tenure (years)	11.11	12.20	11.18	8.73
	(7.50)	(7.70)	(7.44)	(6.94)
workplace characteristics:				
fraction white collar	0.23	0.16	0.23	0.37
	(0.42)	(0.37)	(0.42)	(0.49)
total employment	5426.64	4561.44	5524.55	6380.46
	(9042.18)	(7915.22)	(9106.40)	(10333.75)
firm size	8.67	8.65	8.66	8.80
	(1.30)	(1.17)	(1.35)	(1.20)
fraction exported	41.92	39.69	41.77	46.86
	(25.17)	(23.41)	(25.33)	(25.91)
fraction of males in firm	0.82	0.80	0.83	0.82
	(0.18)	(0.20)	(0.18)	(0.18)
fraction younger than 30 in firm	0.16	0.18	0.16	0.09
	(0.08)	(0.07)	(0.08)	(0.06)
fraction older than 50 in firm	0.20	0.18	0.19	0.25
	(0.09)	(0.08)	(0.09)	(0.09)
regional information:				
fraction west	0.91	0.98	0.90	0.86
	(0.29)	(0.15)	(0.30)	(0.35)
contract information:				
fraction industry contract	0.88	0.89	0.87	0.91
	(0.33)	(0.32)	(0.33)	(0.29)
fraction firm contract	0.07	0.07	0.07	0.05
	(0.26)	(0.26)	(0.26)	(0.21)
fraction individual contract	0.05	0.04	0.05	0.05
	(0.22)	(0.20)	(0.23)	(0.21)
Number of observations	4549887	905787	3145312	498788

Table 5: Summary statistics by skill group, authors' own calculations

Variable	all	sector	firm	no	west	east
daily wage	95.09	96.55	88.43	79.05	97.58	70.07
	(27.98)	(27.32)	(28.14)	(32.45)	(27.11)	(24.10)
log daily wage	4.52	4.54	4.43	4.29	4.55	4.19
	(0.32)	(0.30)	(0.35)	(0.45)	(0.30)	(0.37)
fraction topcoded	0.13	0.13	0.07	0.09	0.14	0.00
	(0.33)	(0.34)	(0.25)	(0.28)	(0.34)	(0.07)
individual characteristics:						
mean age	40.26	40.28	40.20	40.00	40.13	41.58
	(10.17)	(10.18)	(10.02)	(10.16)	(10.20)	(9.73)
fraction male	0.83	0.83	0.82	0.74	0.83	0.73
	(0.38)	(0.38)	(0.39)	(0.44)	(0.37)	(0.44)
fraction german	0.89	0.89	0.91	0.93	0.88	0.99
	(0.31)	(0.32)	(0.29)	(0.25)	(0.32)	(0.09)
mean tenure (years)	11.11	11.50	9.24	7.01	11.75	4.64
	(7.50)	(7.49)	(7.35)	(6.22)	(7.53)	(2.32)
workplace characteristics:						
fraction white collar	0.23	0.23	0.21	0.24	0.23	0.24
	(0.42)	(0.42)	(0.41)	(0.43)	(0.42)	(0.43)
total employment	5426.64	5848.21	3677.17	561.34	5910.42	556.33
	(9042.18)	(9438.98)	(5169.72)	(581.52)	(9341.15)	(594.89)
firm size	8.67	8.81	8.25	6.88	8.84	6.98
	(1.30)	(1.14)	(1.64)	(1.75)	(1.15)	(1.50)
fraction exported	41.92	43.38	31.80	29.18	43.87	23.47
	(25.17)	(24.79)	(23.95)	(26.65)	(24.30)	(25.83)
fraction of males in firm	0.82	0.83	0.82	0.74	0.83	0.73
	(0.18)	(0.18)	(0.19)	(0.24)	(0.17)	(0.24)
fraction younger than 30 in firm	0.16	0.16	0.16	0.17	0.16	0.12
	(0.08)	(0.08)	(0.08)	(0.10)	(0.08)	(0.09)
fraction older than 50 in firm	0.20	0.20	0.19	0.18	0.20	0.21
	(0.09)	(0.09)	(0.09)	(0.11)	(0.09)	(0.11)
regional information:						
fraction west	0.91	0.93	0.80	0.75	-	-
	(0.29)	(0.25)	(0.40)	(0.43)	-	-
contract information:						
fraction industry contract	0.88	-	-	-	0.90	0.64
	(0.33)	-	-	-	(0.30)	(0.48)
fraction firm contract	0.07	-	-	-	0.06	0.15
	(0.26)	-	-	-	(0.24)	(0.36)
fraction individual contract	0.05	-	-	-	0.04	0.20
	(0.22)	-	-	-	(0.19)	(0.40)
skill distribution:						
fraction low skilled	0.20	0.20	0.21	0.17	0.21	0.05
	(0.40)	(0.40)	(0.40)	(0.37)	(0.41)	(0.21)
fraction medium skilled	0.69	0.69	0.72	0.73	0.68	0.78
	(0.46)	(0.46)	(0.45)	(0.44)	(0.47)	(0.42)
fraction high skilled	0.11	0.11	0.07	0.10	0.10	0.17
	(0.31)	(0.25)	(0.26)	(0.30)	(0.31)	(0.38)
Number of observations	4549887	3997819	321145	230923	4138776	410100

Table 6: Summary statistics, authors' own calculations

	industry	**firm**	**no**
food & beverages	82.65	10.35	7.00
tobacco	96.88	3.13	0.00
textiles	54.70	30.20	15.10
clothing	73.26	15.88	10.86
leather	4.31	25.07	70.62
wood	90.50	7.43	2.07
paper	100.00	0.00	0.00
publishing	67.36	11.79	20.85
coke, petroleum	71.68	28.32	0.00
chemicals	86.59	7.07	6.35
plastic products	85.97	8.55	5.48
glas, ceramic	91.02	1.07	7.91
basic metals	76.06	14.80	9.14
fabricated metals	93.73	1.97	4.30
machinery	53.16	4.25	42.58
computer	0.00	0.00	100.00
electrical equipment	96.96	0.27	2.78
radio, TV	35.77	8.01	56.23
instruments	97.82	0.39	1.79
motor vehicles	91.27	0.70	8.03
transport equipment	94.87	4.03	1.10
furniture n.e.c	82.61	0.29	17.10

Table 7: Distribution per agreement type. Source: LIAB, authors' own calculations

	pooled model				
	all	all	low	medium	high
out	0.005	0.007	0.008	0.005	0.008**
	(0.003)	(0.003)	(0.005)	(0.003)	(0.003)
sector	0.061***	0.057***	0.132***	0.042***	0.045**
	(0.022)	(0.017)	(0.028)	(0.015)	(0.020)
out ∗ sector	-0.002	-0.002	-0.009***	-0.001	-0.001
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)
sector	0.047*	0.049**	0.119***	0.035*	0.034
	(0.026)	(0.022)	(0.032)	(0.021)	(0.023)
out ∗ firm	-0.002	-0.001	-0.007**	0.00	-0.001
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)
male	0.185***	0.166***	0.126***	0.184***	0.150***
	(0.006)	(0.004)	(0.004)	(0.005)	(0.005)
german	0.022***	0.002	-0.003	0.020***	0.005
	(0.004)	(0.003)	(0.004)	(0.003)	(0.005)
white	0.086***	0.075***	-0.022**	0.083***	0.074***
	(0.004)	(0.007)	(0.010)	(0.010)	(0.008)
tenure	0.010***	0.011***	0.011***	0.010***	0.016***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
tenure2	0.000***	0.000***	0.000***	0.000***	0.016***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
lskill	-0.172***	-0.117***			
	(0.005)	(0.003)			
hskill	0.408***	0.282***			
	(0.006)	(0.005)			
agegr1	-0.166***	-0.146***	-0.082***	-0.147***	-0.424***
	(0.007)	(0.006)	(0.007)	(0.007)	(0.016)
agegr2	-0.055***	-0.049***	-0.013***	-0.042***	-0.122***
	(0.002)	(0.002)	(0.003)	(0.002)	(0.006)
agegr4	0.029***	0.021***	0.003	0.027***	0.028***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
agegr5	0.039***	0.026***	-0.017***	0.038***	0.043***
	(0.004)	(0.003)	(0.004)	(0.004)	(0.004)
firm1	-0.615***	-0.556***	-0.222	-0.611***	-0.612***
	(0.060)	(0.065)	(0.203)	(0.064)	(0.156)
firm2	-0.418***	-0.401***	-0.411***	-0.388***	-0.705***
	(0.035)	(0.033)	(0.143)	(0.033)	(0.148)
firm3	-0.323***	-0.295***	-0.304***	-0.295***	-0.329***
	(0.033)	(0.030)	(0.064)	(0.030)	(0.057)
firm4	-0.246***	-0.229***	-0.217***	-0.228***	-0.307***
	(0.028)	(0.024)	(0.039)	(0.025)	(0.026)
firm5	-0.169***	-0.156***	-0.156***	-0.154***	-0.191***
	(0.026)	(0.023)	(0.035)	(0.023)	(0.019)
firm6	-0.093***	-0.080***	-0.092***	-0.074***	-0.140***
	(0.024)	(0.022)	(0.033)	(0.022)	(0.017)
firm7	-0.063***	-0.050**	-0.062**	-0.044**	-0.090***
	(0.022)	(0.019)	(0.031)	(0.020)	(0.010)
firm8	-0.048**	-0.038*	-0.058*	-0.031	-0.057***
	(0.021)	(0.020)	(0.030)	(0.020)	(0.010)
firm9	-0.042**	-0.028	-0.035	-0.025	-0.051***
	(0.020)	(0.019)	(0.029)	(0.019)	(0.009)
export	0.001***	0.000	0.000	0.000	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
kaplab	0.000***	0.000***	0.000	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
meanmale		0.132***	0.260***	0.116***	-0.041
		(0.020)	(0.025)	(0.021)	(0.034)
meanageu30		-0.597***	-0.426***	-0.533***	-0.691***
		(0.084)	(0.142)	(0.092)	(0.091)
meanageue50		0.390***	0.236*	0.391***	0.203***
		(0.091)	(0.143)	(0.098)	(0.077)
meanalter		-0.020***	-0.015**	-0.018***	-0.014***
		(0.004)	(0.006)	(0.005)	(0.004)
meanlskill		-0.212***	-0.126***	-0.256***	-0.151***
		(0.024)	(0.028)	(0.030)	(0.030)
meanhskill		0.337***	0.439***	0.403***	0.218***
		(0.020)	(0.050)	(0.027)	(0.023)
cons	4.128***	4.923***	4.428***	4.84***	5.283***
	(0.046)	(0.171)	(0.263)	(0.194)	(0.161)
N	2830595	283059	570214	1947490	312891
R^2	0.526	0.575	0.414	0.488	(0.447)

We furthermore used a full set of industry, year and federal state dummies as well as industry-wide time trends that are not explicitly listed here.

Table 8: Estimation Results.

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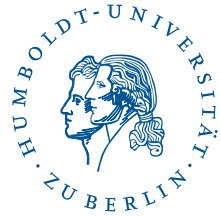

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